

TEACHERS' RETIREMENT BOARD

INVESTMENT COMMITTEE

SUBJECT: Asset Allocation- Final Report

ITEM NUMBER: 7

ATTACHMENT(S): 2

ACTION: X
1999

DATE OF MEETING: September 1,

INFORMATION: _____

PRESENTER(S): Mr. Emkin

EXECUTIVE SUMMARY

CalSTRS has an Investment Management Plan that serves as a blueprint for management of the investment portfolio. The Investment Management Plan includes a provision for a biennial asset allocation review to be completed by the Investment Committee. Today's presentation, by Pension Consulting Alliance (PCA), is the third of three asset allocation presentations. The objectives of this presentation include:

1. Recap of the asset allocation process
2. Review the selected optimization approach
3. Review asset class expectations and limitations
4. Present results provided by the asset allocation modeling process

The material included as Attachment 1 identifies the minimum and maximum constraints, expected returns, expected risks, and expected correlation, efficient frontier analysis, and asset modeling scenarios. The material included as Attachment 2 provides a preview of the verbal presentation scheduled for the September meeting and is included as directed by the Investment Committee. Ten asset allocation alternatives are listed on page 8 of Attachment 2. The alternative will be discussed at the September meeting.

Representatives from Callan, Mercer, and Pension Consulting Alliance will be active in the presentation and will be available for questions.

*Attachment 1
Investment Committee – Item 7
September 1, 1999*

CalSTRS Asset Allocation Review-1999

By Pension Consulting Alliance, Inc.

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A Brief Review of Asset Allocation

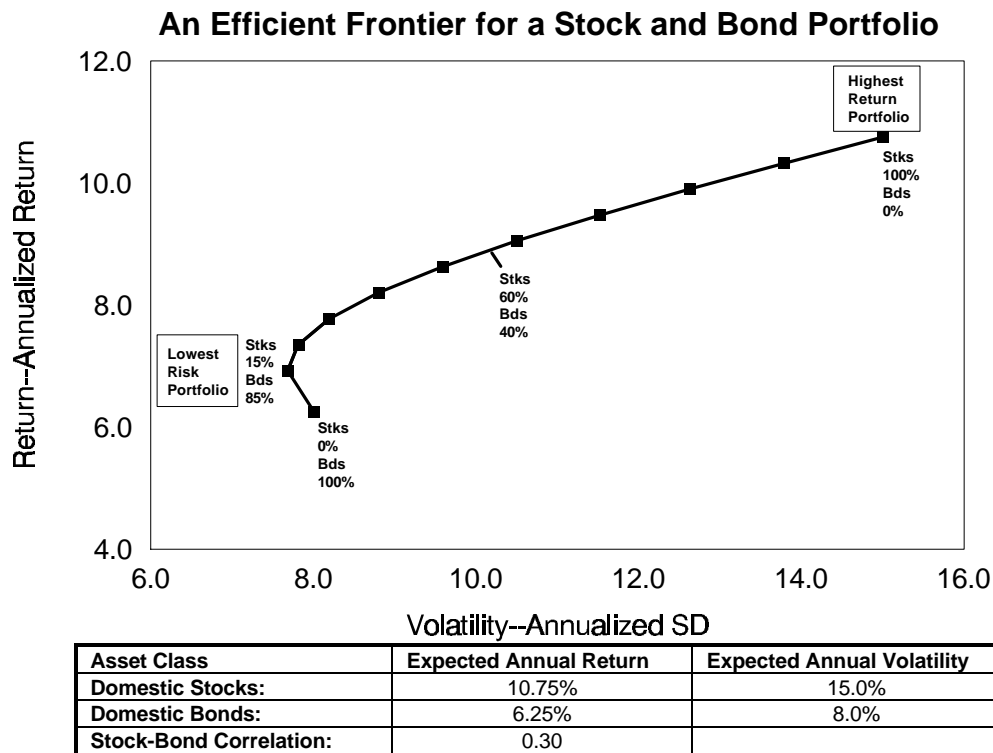
The goal of an investment portfolio in a defined benefit plan is to provide assets that meet the agreed upon benefits that the plan's participants will receive in retirement. In order to meet this goal, plan assets (the portfolio) must grow at least as quickly the value of these cash flow requirements (which are the plan's "liabilities") to ensure that the overall plan remains in healthy financial condition. There are only two methods for increasing plan assets to meet plan liabilities: investment growth and contributions.

Higher investment growth will lead to lower required contributions and vice versa. However, the investment growth rate will be influenced heavily by the plan's tolerance for investment risk, which is reflected in the plan portfolio's asset allocation policy. Therefore, quantifying an acceptable level of overall portfolio risk associated with adopting a specific policy is critical. In addition, near-term cash flow requirements of the plan should influence portfolio structure. Building a portfolio across a spectrum of various classes of investment assets is the key step in addressing these and other issues.

A diversified investment portfolio consists of multiple asset classes whose investment returns respond differently to varying economic scenarios. Diversified portfolios are attractive because the combination of various asset classes can reduce expected risk while maintaining expected return.

Combining assets having different return patterns can produce a portfolio that has much lower volatility (risk) than any individual asset while producing returns that are competitive. Maximizing return while reducing risk increases the probability of meeting a specified return objective.

Efficient Frontier Analysis is a widely accepted method of analyzing the tradeoff between risk and return across portfolios having different mixes of assets. Through this quantitative technique (which relies on several critical assumptions), an optimization process identifies portfolios of assets providing the highest expected return, given a specified level of risk. The procedure continues to determine ideal portfolios at varying levels of risk until an entire range of ideal portfolios (termed an "efficient frontier") is identified below.



In selecting certain combinations of assets (such as domestic equity and fixed income) any rational investor will always consider the tradeoff between changes in return and changes in risk. At a minimum, investors should expect to receive a higher rate of return for an incremental increase in investment risk.

Each mix of assets is, in itself, a unique asset having its own return-vs.-risk tradeoff. As highlighted above, these asset portfolios can exhibit return patterns that differ greatly from any underlying asset. Depending on the extent of how individual assets move in relationship to each other (measured by correlation), certain mixes of assets could enhance the return-risk tradeoffs over investing in any single asset.

The curve-point in the curve in the efficient frontier chart shows when adding a certain proportion of stocks ceases to add value (simultaneously adding return and reducing risk). This point comes when stocks become 13% of the portfolio. Beyond this point, the only way to increase return is to increase risk incrementally. For those points along the line past the curve point, the only decision one has to make is how much incremental risk one is willing to accept. The only way to increase return will be to accept incremental increases in investment risk (uncertainty). The line between the curve-point and the “100% stocks” point is termed the “efficient frontier.” Any point along the efficient frontier represents that unique portfolio that offers the highest return for the given amount of risk.

Adding additional asset classes to the list of possibilities enhances the return-risk tradeoffs among the ideal portfolios along the efficient frontier. For example, adding international equities to the stock-bond portfolios above significantly improves the expected outcomes of the efficient frontier.

The Asset Allocation Process

The key goal of the asset allocation process is develop an asset allocation policy that maximizes the likelihood that an investment portfolio's assets will, over the planning horizon, fund Plan benefits. To accomplish this task, an asset allocation study should contain several key steps.

Steps Involved in Setting Asset Allocation Policy

Overview and Planning Steps

1. Review rationale for policy.
 - importance of diversification
2. Review financial condition of Plan.
 - assets versus projected liabilities (balance sheet)
 - projected contributions versus projected benefits

Investment Related Steps

3. Review rationale for investment asset classes in light of plan financial requirements.
4. Develop expectations for asset class investment performance (returns, risks, correlations).
5. Identify investor-specific constraints that might limit investment strategies (e.g., liquidity).
6. Create model portfolios, incorporating objectives, assumptions, and constraints.
7. Isolate investor-specific model portfolio to represent an investor's asset allocation policy.
8. Perform additional sensitivity analyses to quantify impact of specific issues.
 - adjustments to required rate of return
 - shift in financial condition of Plan due to funding

Once the rationale for undertaking an asset allocation study is understood, a review of the financial condition of the plan becomes imperative. A key component of reviewing a plan's financial condition is studying the actuarial requirements of the plan. These requirements represent the plan's long-term liabilities and, when combined with the plan's investment portfolio, constitute a pension plan's balance sheet. Understanding what factors (such as changes in interest rates, benefit structures, and plan demographics) influence these liabilities is important. Changes in these and other underlying factors may, in fact, alter a plan's liability structure. Such shifts could, in turn, impact the plan's financial condition. CalSTRS' were studied and considered as part of this asset allocation review.

Selecting Asset Classes for Portfolio Investment

As discussed earlier, there are three components required to model investment returns: (1) asset class expected returns, (2) asset class risks, and (3) correlations among asset classes. Investment consultants develop these components, which are then used to develop efficient frontiers quantitatively. CalSTRS' current long-term expected returns and risks for various assets classes range from 4.0%/year to 15.0%/year.

Total Return and Risk Estimates **Assumed inflation level: 3.0% per year**

Asset Class	Expected Annual Return	Expected Risk (Annld. SD)
Cash	4.50	1.5
Domestic Bonds	6.25	8.0
Global Bonds	6.13	8.0
Domestic Stocks	10.75	15.0
International Stocks	10.50	18.0
Private Markets	12.50	16.0
Emerging Markets	14.00	30.0

These return and volatility estimates reflect several basic relationships:

1. Investors or lenders of capital require an incremental real return premium as a reward for making capital available. Historically, this real risk-free rate has approximated 1% per year.
2. Equity-oriented investment should, over long periods, produce return premiums that are higher than their fixed-income counterparts.
3. The private markets asset class is a combination of both real estate and alternative investments.
4. The return assumptions for the publicly-traded asset classes do not account for added value opportunities within each asset class.
5. Higher expected total returns are the result of taking incremental risk.

Review of Asset Allocation Policy

Over the last thirteen years, CalSTRS' asset allocation policy has shifted modestly.

CalSTRS Asset Allocation Policy Trends (in %)

Asset Class	Current	1995	1993	1986
Domestic Equities	38	34	33	40
Foreign Equities	25	18	18	15
Public Equity	63	52	51	55
Realty	5	5	10	10
Venture	5	3	7	5
Total Equity	73	60	68	70
Global	0	5	1	---
Fixed-Income	26	34	30	30
Cash	1	1	1	0
Stable Assets	27	35	31	30
Total	100	100	100	100

With the exception of 1995, CalSTRS' investment policy has remained virtually intact from an equity/stable asset allocation viewpoint. In 1986, CalSTRS' policy had an allocation of 70% equities and 30% stable assets. In 1997, CalSTRS' Board adopted a similar policy (73% equity and 27% stable assets). In 1995, CalSTRS' policy emphasized equity-oriented assets to a lesser extent. This shift was largely the result of CalSTRS' decision to rely less on the private-equity portion of the portfolio.

Strategic Asset Allocation

The System's asset allocation strategy utilizes a design for today's needs, while anticipating the future capacity and growth of the investment portfolio. A strategic asset allocation target for public equity, private equity, liquidity, and public debt was last established in 1997 after reviewing a comprehensive asset allocation analysis completed by Pension Consulting Alliance. In conjunction with the strategic target, a range for each asset category has been established to provide flexibility designed to reduce rebalancing costs and allow flexibility to adapt to changing market conditions. To control the risk and return relationship each asset category must be rebalanced to the strategic target occasionally. Rebalancing latitude is important and can significantly affect the performance of the portfolio. Blind adherence to narrow ranges increases transaction costs without a

documented increase in performance. A rebalancing range that is too wide may cause undesired changes in the asset allocation. The identified range can be modified by the Investment Committee. The range is plus or minus three percent around the strategic target for the major asset categories (domestic equity, international equity, and fixed income). The range is plus or minus two percent around the strategic target for the other asset categories (private equity and cash). The two or three percent range refers to the market value of the total investment portfolio.

CalSTRS Policy Target and Ranges

	Strategic Target	Range
Domestic Equity	38%	35% to 41%
International Equity	25%	22% to 28%
Total Public Equity	63%	57% to 69%
Private Equity*	10%	8% to 12%
Total Equity	73%	68% to 77%
Debt	26%	23% to 29%
Cash	1%	0% to 3%
Total Public Debt	27%	23% to 32%
Total Strategic Asset Allocation	100%	

- Please note that the allocated not funded portion of the private equity will be invested in the S&P 500 Indexed portfolio. This amount will be shown as private equity – S&P 500 Index.

Comparison of Strategic Allocation versus Other Similar Funds

One method to assessing the reasonableness of CalSTRS' strategic asset allocation policy is to compare its policy with those of other funds. Given CalSTRS' size and scale, there is only a small group of funds that might qualify as CalSTRS' peers. Even within this group, there are different plan structures, tolerances for risk, and organizational issues that distinguish one fund from the other. Given these issues, a peer comparison can still shed light on how CalSTRS' policy is consistent with or differs materially from other institutions having similar characteristics.

For the last several years, CalSTRS has compared itself to eight large public funds. Each fund has an investment portfolio with a market value of at least \$20 billion. CalPERS is the largest peer fund with an investment portfolio valued at approximately \$150 billion. The other funds include Colorado Public Employees' Retirement Association, Minnesota State Board of Investments, New Jersey Division of Investments, New York State Common Fund, Ontario Municipal Employees' Retirement System, Pennsylvania Public School Employee Retirement System, and Pennsylvania State Employee Retirement System.

CalSTRS' strategic investment policy is in-line with its peers. Allocations within a specific asset class may differ from the average peer, but CalSTRS does not maintain any extreme allocations.

The expected risk-adjusted performance of CalSTRS' strategic allocation tends to be slightly more conservative than that of its peers. However, based on the underlying return and risk assumptions, CalSTRS' allocation should provide a more optimal outcome.

CalSTRS' 1999 Strategic Asset Allocation Decision-Making Process

In order to obtain more input into the asset allocation decision (and other important policy considerations) the CalSTRS Investment Committee adopted a multi-consultant approach. Previously the System retained a single consultant relying on that consultant and the System's staff for input on most policy matters. Incorporating three firms: Mercer, Callan and PCA along with the staff in the decision-making process was designed to provide additional dialogue and debate and result in more informed decisions.

The process was initiated in the 1999 Asset Allocation review. The staff coordinated the work of the three consultants in the development of the key asset allocation assumptions (previously discussed) which drive the optimization model. The results of that process were presented to the Investment Committee on August 4, 1999. The Committee made good use of the multiple consultants asking many questions and requesting and receiving differing opinions. The consultants were in general consensus on the major issues discussed.

As a result of the presentations the Investment Committee made one significant change to the inputs reducing the maximum allocation to non-\$ equities to 25%. Additionally, at the staff's suggestion the Committee elected to do the optimization using one set of assumptions versus using each consultant's. The results of the new optimization are provided under separate cover.

***CalSTRS* Asset Allocation Review - 1999**

Phase 3: A Final Recap of Optimization Results



to the CalSTRS Investment Committee

September 1, 1999

***CalSTRS* Asset Allocation Review - 1999**

Phase 3: A Final Recap of Optimization Results

Agenda:

- A Brief Review of August Presentation
 - asset class assumptions
 - findings of various analyses
- Refined Set of Constraints
 - limit international equity exposure
- Compare to Existing Policy

CalSTRS Asset Allocation Review - 1999

Phase 3: A Final Recap of Optimization Results

Studied Various Consultant Expectations:

Expected Returns and Risks*

	99 Callan	99 Mercer	99 PCA		Callan	Mercer	PCA
US Eq	10.93	11.80	9.75		16.30	19.50	20.00
Int'l Eq	12.51	12.30	9.90		21.50	23.00	22.00
US Fix	5.94	6.10	5.50		5.30	7.30	10.00
Alt Inv	18.98	18.30	13.75		36.00	35.00	30.00
Real Estate	9.56	8.50	9.75**		16.50	13.00	14.00**
Cash	4.60	4.50	4.00		0.70	2.00	1.50
Inflation	3.22	2.50	2.50		1.75	2.50	1.00

*Arithmetic single-period averages. Over the next ten years, in any one year, an asset class will be expected to produce its expected return and risk. For example, based on PCA's assumptions, there is a two-thirds chance that, in any one year, domestic equities will produce a return between minus (10.25%) and 29.75% with an average expected return of 9.75%.

**This assumption reflects CalSTRS' multi-risk strategy structure, per the CalSTRS1999 Real Estate Business Plan

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Phase 3: A Final Recap of Optimization Results

Consultant Expectations (cont.):

Expected Correlations

US Eq													
Callan	1.00												
Mercer	1.00												
PCA	1.00	Int'l Eq											
Callan	0.57	Callan	1.00										
Mercer	0.50	Mercer	1.00										
PCA	0.20	PCA	1.00	US Fix									
Callan	0.33	Callan	0.30	Callan	1.00								
Mercer	0.50	Mercer	0.25	Mercer	1.00								
PCA	0.55	PCA	0.20	PCA	1.00	Alt Inv							
Callan	0.60	Callan	0.45	Callan	0.20	Callan	1.00						
Mercer	0.70	Mercer	0.25	Mercer	0.20	Mercer	1.00						
PCA	0.40	PCA	0.15	PCA	0.15	PCA	1.00	Real Estate*					
Callan	0.50	Callan	0.41	Callan	0.40	Callan	0.30	Callan	1.00				
Mercer	0.60	Mercer	0.20	Mercer	0.30	Mercer	0.50	Mercer	1.00				
PCA	0.20	PCA	0.20	PCA	0.15	PCA	0.85	PCA	1.00	Cash			
Callan	-0.12	Callan	-0.25	Callan	0.12	Callan	0.07	Callan	-0.06	Callan	1.00		
Mercer	0.00	Mercer	0.00	Mercer	0.10	Mercer	0.00	Mercer	0.20	Mercer	1.00		
PCA	0.40	PCA	0.00	PCA	0.15	PCA	0.10	PCA	0.10	PCA	1.00		
										Inflation			
Callan	-0.15	Callan	-0.23	Callan	-0.25	Callan	-0.13	Callan	-0.13	Callan	0.24	Callan	1.00
Mercer	-0.20	Mercer	-0.40	Mercer	-0.35	Mercer	-0.10	Mercer	0.00	Mercer	0.60	Mercer	1.00
PCA	-0.50	PCA	-0.40	PCA	-0.20	PCA	0.10	PCA	0.00	PCA	0.25	PCA	1.00

*Reflects Multi-Risk Strategic Structure per 1999 CalSTRS Real Estate Business Plan

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Phase 2: An Initial Study of Optimization Results

Introduced Constraints to Reflect Practical Issues:

Asset Class	Minimum %	Maximum %	Comments
Cash	1	1	Reflects policy to remain fully invested.
Fixed Income	20	100	Needed to provide income to plan.
Real Estate	2	5	Minimum reflects allocated, but not yet funded levels. Maximum reflects difficulty of funding asset class rapidly.
Domestic Equity	25	100	Needed to provide real growth to plan assets.
International Equity	0	35	Represents either risk-adjusted opportunity or diversifier.
Alternative Investments	2	5	Minimum reflects allocated, but not yet funded levels. Maximum reflects difficulty of funding asset class rapidly.

...constraints used in modeling process to identify ideal portfolio

***CalSTRS* Asset Allocation Review - 1999**

Phase 2: An Initial Study of Optimization Results

In light of assumptions and constraints, conclusions were:

- Asset mixes similar regardless of which consultant's assumptions were used
- Asset mixes very sensitive to return expectations
 - e.g., reducing return of international equities by 25bp caused major shift to domestic equities

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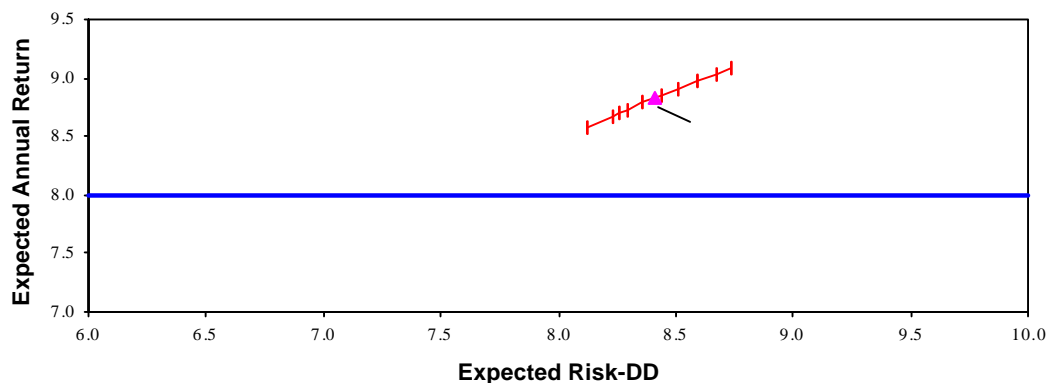
Phase 3: A Final Recap of Optimization Results

A Final Set of Revised Constraints:

Asset Class	Minimum %	Maximum %	Comments
Cash	1	1	Reflects policy to remain fully invested.
Fixed Income	20	100	Needed to provide income to plan.
Real Estate	2	5	Minimum reflects allocated, but not yet funded levels. Maximum reflects difficulty of funding asset class rapidly.
Domestic Equity	25	100	Needed to provide real growth to plan assets.
International Equity	0 0	35 25	<i>Adjusted to better reflect Committee risk tolerance and preferences</i>
Alternative Investments	2	5	Minimum reflects allocated, but not yet funded levels. Maximum reflects difficulty of funding asset class rapidly.

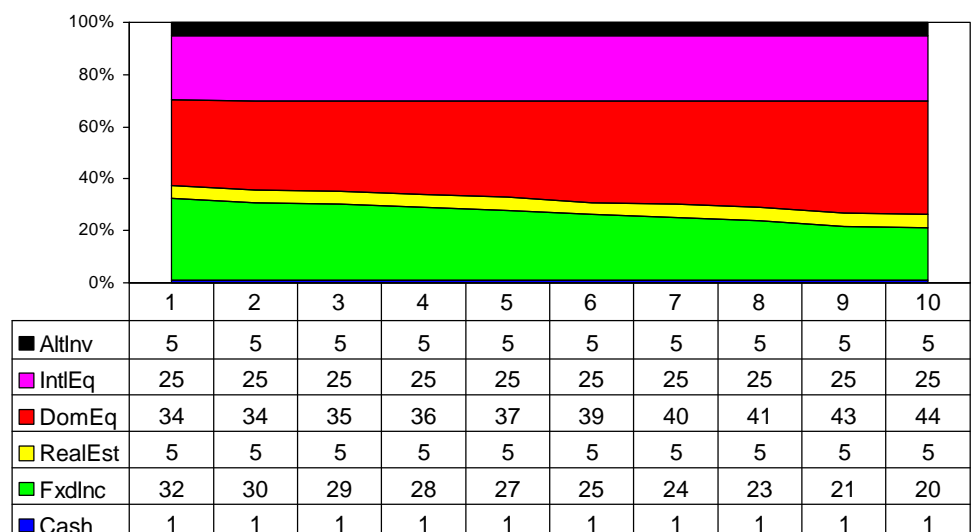
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Phase 3: A Final Recap of Optimization Results



Portfolio	1	2	3	4	5	6	7	8	9	10
Exp. Ret.	8.6	8.7	8.7	8.7	8.8	8.9	8.9	9.0	9.0	9.1
Prob. < 8%	48.4	48.1	48.0	47.9	47.8	47.6	47.5	47.3	47.2	47.0

Constrained Frontier
Max of 25% to Int'l Eq.
w/ PCA Assumptions



8% minimum return goal

Following asset constraints:

-
-
-
-
-

CalSTRS Asset Allocation Review - 1999

Phase 3: A Final Recap of Optimization Results

Asset Class	Portfolio 6	Current Policy
Cash	1	1
Fixed Income	25	26
Real Estate	5	5
Domestic Equity	39	38
International Equity	25	25
Alternative Investments	5	5
Expected Annual Return	8.83	8.85
Downside Deviation	8.41	8.44
Prob. < 8%	47.7%	47.6%

...no material difference between current policy and efficient frontier

***CalSTRS* Asset Allocation Review - 1999**

Phase 3: A Final Recap of Optimization Results

Conclusions

- Existing Policy Optimal Under Current Constraints
- Only Reasons for Adjusting Policy: Change in Committee Preferences of Risk Tolerance